

REMARKS

This is in response to the non-final Official Action currently outstanding with regard to the above-identified application.

Claims 1-20, 22-47 and 49-51 were present in this application at the time of the issuance of the currently outstanding Official Action. Claims 21 and 48 were previously canceled, without prejudice. Further, as a result of Applicants' election in response to the Restriction Requirement of 12 March 2007 in the above-identified application, Claims 1-17, 29 and 34-39 stand withdrawn from further consideration as being directed to a non-elected invention. By the foregoing Amendment, Applicants have proposed the further amendment of Claim 18 and also have proposed the addition of new Claims 52 - 55. Applicants do not proposed the cancellation or withdrawal of any further claims. Accordingly, upon the entry of the foregoing Amendment, Claims 18-20, 22-28, 30-33, 40-47 and 49-55 will constitute the claims under active prosecution in this application.

The claims of this application are set forth above showing the changes made and including appropriate status identifiers as required by the Rules.

In the currently outstanding Official Action, the Examiner has:

1. Not re-acknowledged Applicants' claim for foreign priority under 35 USC §119 (a)-(d) or (f), and confirmed the receipt by the United States Patent and Trademark Office of the required copies of the priority documents – These matters were acknowledged by the Examiner in the Official Action in this application dated 28 June 2007..

2. Not re-acknowledge the acceptance of the formal drawings filed with this application on 22 December 2005 – **Applicants respectfully note for the record that the formal drawings for this application as filed on 22 December 2005 previously were accepted by the Examiner in the Official Action in this case dated 28 June 2007..**
3. Withdrawn his previous rejections of claim 18 and by extension claims 20, 22-27 and 40-49 that depend either directly or indirectly therefrom under 35 USC 102(b) as being anticipated.
4. Rejected Claims 18-20, 22, 25, 26 and 40-42 under 35 USC 103(a) as being unpatentable over the Kim (US 6,880,916)
5. Rejected Claims 23, 24, 27 and 43-49 under 35 USC 103(a) as being unpatentable over the Kim reference in view of the Gue, et al reference (US 2004/0090483).
6. Rejected Claims 28, 50 and 51 under 35 USC 103(a) as being unpatentable over the Kim reference in view of the Gue, et al reference (US 2004/0090483) further in view of Noguchi (US 2001/0017639)

7. Rejected Claims 30 to 33 51 under 35 USC 103(a) as being unpatentable over the Kim reference in view of the Gue, et al reference (US 2004/0090483) further in view of Agarwal (US 6,290,331). – **Applicants respectfully note that the Agarwal (US 6,290,331) reference previously relied upon by the Examiner still is not listed on any Notice of References Cited (Form PTO – 892) that accompanied the currently outstanding Official Action or on any other Form PTO – 892 present in the prosecution of this application. It is respectfully requested that a Notice of References Cited (Form PTO-892) be issued in response to this submission listing the cited and applied Agarwal reference for the record.**

Further comment with regard to items 1-3 above is not deemed to be required in these Remarks.

With respect to items 4-7 above, Applicants respectfully note that the differences between the Examiner's previous grounds for rejection and those stated in the currently outstanding Official Action are centered around the newly cited Kim reference that the Examiner now asserts discloses:

A first nozzle layer having a first nozzle hole through which a liquid substance is discharged (Fig. 4, Plate 3)

a second nozzle layer having a second nozzle hole that is connected to the first nozzle hole and receives the liquid substance (Figure 4, passage plate 200) and

a discharge layer that has an opening provided on a substance discharging side in a liquid substance flow direction of the first nozzle layer, the opening determining a diameter of the discharge opening of the liquid substance discharge side (Figure 4, plate 302) and

the first nozzle hole penetrating the first nozzle layer and being connected with the opening (Figure 4)

wherein a surface of the discharge layer facing the liquid substance discharge side is flush with a surface of the first nozzle layer facing the liquid substance discharge side (plate 302 is flush with the liquid discharge side of plate 301, Figure 4)

More particularly, the Examiner apparently now judges that the layers 302 and 301 in Figure 4 of the Kim reference correspond to the discharge layer (14) and the first nozzle layer (1) in the present application, respectively. Furthermore, it appears that the Examiner deems that the surface of the layer 302 facing the liquid substance discharge side is flush with the surface of the layer 301 facing the liquid substance discharge side. Applicants do not agree and therefore respectfully traverse the Examiner's construction of the disclosure of the Kim reference.

In support of this traversal of the Examiner's interpretation of the Kim reference, Applicants respectfully note that as shown in Figure 15(b) of the present application, the upper surface of the discharge layer 14 is flush with the upper surface (i.e., the outermost surface) of the first nozzle layer 1. On the other hand, in the Kim reference (as shown in Fig. 4), the lower surface of the layer 302 (opposite to its discharge side) is flush with the upper surface (discharge side) of the layer 301. Accordingly, Applicants respectfully submit that it is apparent that while the Examiner has alleged that the layer 302 is flush with the liquid discharge side of the layer 301 in the Kim reference, the true fact is only that the layer 302 is disposed above the layer 301 such that the liquid discharge side of the layer 301 is flush with the **non-discharge side of the layer 302**.

In the latter regard, Applicants respectfully call the Examiner's attention to the fact that Claim 18 of the present application now has been amended so as to specifically call for "a surface of the discharge layer facing the liquid substance discharge side is flush with a surface of the first nozzle layer facing the liquid discharge side", and that such is a feature of the present invention that is clearly different from the structure disclosed by the Kim reference.

Furthermore, in order to make the foregoing abundantly and unambiguously clear with respect to the wording “flush with”, Applicants now also have amended Claim 18 so as to clarify the fact that the **first nozzle layer 1** has such a shape that there is provided a concave portion at a part of the plane of its surface facing the **liquid discharge side thereof** wherein the **discharge layer** is located (embedded) on the concave portion, and the cross-section of the first nozzle layer 1 is of the shape of the letter “L” or of the shape of a stairs as shown in Figure 15 (b). In other words, by the foregoing amendment Applicants have clarified the relationship between the first nozzle layer and the discharge layer relative to one another.

Thus, it will be understood from the attached Figures A and B (see Appendix I attached hereto) and the present amendment that the first nozzle layer 1 has three surfaces, namely, the outer surface 1a (upper side in the figures A and B), the inner surface 1c (lower side in the figures A and B) and the intermediate layer 1b (that locates the surface of the concave portion in the Figures A and B). Furthermore, *the outer surface 1a is flush with the surface 14 a of the discharge layer 14 facing the liquid substance discharge side* (a structural relationship that clearly does not exist in the Kim reference).

In addition, Applicants respectfully submit that in the Kim reference the layer 302 covers substantially the entirety of the outer surface of the print jet head *including the vicinity of the discharge layer*. In the present invention, on the other hand, the discharge layer (14) is provided in the vicinity of the discharge opening, while the first nozzle layer is provided at other than the vicinity of the discharge opening. Accordingly, it will be recognized that in the present invention the material in the vicinity of the discharge opening may be (and is) different from the material at other than the vicinity of the discharge opening.

Applicants respectfully submit that it should be recognized as well that in dependent claim 30 of the present application it is stated that the discharge layer is made of a material such as Al while the first nozzle layer is made of a material such as a silicon compound. In this regard, Applicants recognize that the Examiner has suggested that the Agarwal reference discloses various materials with regard to the subject matter of present claim 30, but nevertheless respectfully submit it should be noted that the Examiner has rejected claim 30 without referring to a material of the discharge layer and further that the Agarwal reference does not disclose that materials are changed in the vicinity of the discharge opening, or for that matter what material is to be utilized in the vicinity of the discharge opening. Page 119 of the present specification, on the other hand, discloses the formation of the discharge layer portions in the vicinity of the discharge opening with a specific material usually different from the remainder of the discharge layer in order to insure precision in the shape of the discharge opening.

The newly added dependent claims are included hereinabove to accentuate the foregoing points as well as the fact that the use of a square shaped discharge layer to reduce stress in the nozzle plate (see present specification at page 115) and the fact that a part of the liquid repellent film entered inside the first nozzle hole is etched away without deformation of the discharge opening thereby making possible a reduction in the processing accuracy of the discharge opening during normal manufacturing operations.

Furthermore, for the sake of completeness of this presentation, Applicants hereby repeat their previous comments distinguishing the previously cited and relied upon art from the present invention in further support of their position that the claims as hereinabove amended are patentable over that art.

Thus, Applicants again respectfully submit that whether the layer of the Gue et al reference that is deemed to correspond to the first nozzle layer of the present invention is taken as being the Gue layer 26 or the Gue layer 22, the clear difference between the Gue et al reference and the present invention is that the Gue member 25 (which is the heating resistance) has a ring shape with an inner diameter **larger** than the diameter of the nozzle hole 24.

More specifically, as previously mentioned, according to the Gue et al reference, the Gue member 25 is for providing a heating resistance. Thus, Gue at paragraph [0101] states that: “The membrane (SiO₂ layer 22 and SiN_x layer 23 see Fig. 2 and paragraph [0097]) supports an integrated heating resistance (25), usually made of strongly doped polycrystalline silicon in order to achieve the lowest possible electrical resistivity.” Further, the Gue reference indicates at paragraph [0120] that the polysilicon resistance (25) – see paragraph [0115] – is covered with a spin on glass type silicon layer (26) **so that it is electrically and chemically protected from the outside environment**. Still further, Gue indicates at paragraph [0121] that the hole 24 is made **at the centre of the heating resistance** by chemically etching the spin-on glass (i.e., layer 26) plasma etching the SiN_x (i.e., layer 23) and chemically etching the SiO₂ layer 22.

Therefore, Applicants respectfully again submit that it is clear that the Gue reference is quite different from the present invention wherein, as is shown specifically in Fig. 15(b), the diameter of the discharge opening 11c is such as to be defined (determined, or coincides) with the diameter of the discharge opening in the discharge layer. This is deemed to be an important feature of the present invention that the previous Amendments to Claim 18 and Claims 40-52 were believed to clearly and definitely emphasize.

Specifically in the latter regard, reference was respectfully directed to the present specification at page 125, line 14 to page 126, line 6; Page 128, last line to page 127, line 5; and Page 130, line 8-19 as examples of the repeated disclosure in the present specification of the need to establish high precision in the formation of the discharge opening and the accomplishment of that goal by forming the discharge opening directly in the discharge layer 14 shown in the drawings of the present application, rather than in a spin on glass layer covering a ring-shaped heating resistance like that shown at 25 in the Gue reference *so as to keep the discharge layer electrically and chemically protected from the outside environment (see Gue at paragraph [0120])*..

In view of these previous amendments, Applicants respectfully submitted that the Gue et al reference is insufficient to teach, disclose or suggest to one of ordinary skill in the art as of the time that the present invention was made the importance of precision in the formation of the discharge opening that requires the nature of the material of the discharge layer to evidence a significant difference in etching resistance relative to the other layers of the nozzle plate herein claimed.

Consequently, Applicants respectfully reiterate their belief in view of their previous Amendment that the Examiner's rejection of Claim 18, the only pending independent claim had been totally and completely overcome. In particular, the discharge layer was claimed as:

a discharge layer that has an opening and has a higher resistance to etching than the first nozzle layer, the discharge layer being provided on a liquid substance discharging side in a liquid substance flow direction of the first nozzle layer, the opening determining a diameter of a discharge opening of the liquid substance discharge side

Nevertheless, in the previous FINAL Official Action (now withdrawn) the Examiner still maintained that the layer 25 of the Gue reference is located on the liquid discharging side (measured radially relative to the hole 24) of the layer 26 *even while he admits that the Gue reference fails to disclose the added limitations “in a liquid substance flow direction” and “the opening determining a diameter of the discharge opening”*. In addition, the Examiner in that FINAL Official Action again asserted that since polycrystalline silicon is well known to be resistant to etching, it would have been obvious to one of ordinary skill in the art to make the discharge layer out of polycrystalline silicon.

Furthermore, according to the Examiner's previous position (now apparently overcome by Applicants' previous argument), the Radke reference teaches a metal layer [gold layer , 16] *bonded to a discharge layer 14* both above and below which defines a diameter of the discharge hole [Figure 1]. Further, according to the Examiner's earlier argument, it would have been obvious to one of ordinary skill in the art at the time that the present invention was made to modify the Gue reference with the Radke invention because so doing would prevent delamination of the print head.

Applicants could not (and do not) agree. What the Examiner appeared to be postulating at this point in his previous argument was that a gold coating (film) covering the Gue structure composed of layers 22, 25 and 26 so as to line the opening 24, the top of the layer 26 and the bottom of the layer 22 with a gold metallic coating in a manner that arguably would define a structure within the terms of the present Claim 18. The facts remained, however, that the element that is coated in such a combination is not a substitute for the discharge layer 25. Indeed, it is to be recalled that the discharge layer 25 of the Gue reference is surrounded by the layers 26 and 22 *so that it is electrically and chemically protected from the outside environment*.

Hence, the layers that would actually be coated by the gold coating in the Examiner's postulated combination failed to correspond to the claimed structure for the same reasons that the Gue structure itself does not conform to the presently claimed structure. It, therefore, is only if one is willing to assume (as the Examiner apparently previously did) that the Gue layers 22 and 26 correspond to the claimed "nozzle plate" ("discharge layer" in the Examiner's terms) 14 of the Radke reference while the gold coating somehow corresponds to the discharge layer 25 of the Gue reference that in the Gue reference is embedded *for protection from the outside environment* within the structure represented by the Gue layers 22 and 26 that the Examiner's proposed combination could even arguably be asserted to meet the terms of the present claim. Applicants successfully argued that the latter conjecture is simply too far away from any justifiable combination of the Gue and Radke references to be anything other than improper hindsight reasoning.

In other words, from the Examiner's earlier perspective it was desirable in support of his rejection to argue that Radke suggests coating the overall structure represented by the Gue elements 22, 25, 26 with a gold coating such that that gold coating serves to aid in the prevention of delamination of the Gue layers and becomes the layer formed of a material that defines the discharge opening, that is highly etch resistant and is arguably located (at least in part) on the liquid substance discharging side in the liquid substance flow direction.

Applicants pointed out, however, that the difficulty with the Examiner's approach was that it totally disregards the specific structure disclosed by Gue, *including the reasons that the various layers thereof are formed in the manner that they are relative to one another*.

Therefore, it was recognized that it is so well known as not to require any particular citation of authority that in determining whether or not a claim is obvious in view of a combination of references the principles of operation of each of the combined references cannot be changed in the course of the making of the combination relied upon in order to renders the particular claim at issue obvious; and that it is improper to utilize the claim at issue as a frame within which to build a mosaic from bits and pieces of the prior art in an attempt to recreate the claimed invention.

Consequently, without a clear suggestion to combine that art in the manner proposed, and in the face of teachings in the Gue reference clearly and definitely indicating that the discharge layer 25 should be electrically and chemically protected, Applicant respectfully successfully argued that it is not proper for the Examiner in the present circumstances to reject the present claims as being “obvious” over his improperly created combination.

For each and all of the foregoing reasons and in light of the amendments proposed hereinabove, therefore, Applicants respectfully submit that the entry of the foregoing Amendments would place this application in condition for allowance. Consequently, a decision entering the foregoing Amendment, reconsidering the present application in view thereof, and allowing this application with the claims as hereinabove amended in response to this communication is respectfully requested.

Applicants also believe that additional fees beyond those submitted herewith are not required in connection with this communication. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge and/or credit Deposit Account No. **04-1105**, as necessary, for the correct payment of all fees which may be due in connection with the filing and consideration of this communication.

Respectfully submitted,

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SIGNATURE OF PRACTITIONER

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